Cl. 25-29

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:
B23Q 16/00, F16F 9/49	A1	WO 95/01853
		(43) International Publication Date: 19 January 1995 (19.01.95)

(21) International Application Number: PCT/IT93/00119

(22) International Filing Date: 19 November 1993 (19.11.93)

(30) Priority Data:
GE93A000059 6 July 1993 (06.07.93) IT

(71)(72) Applicant and Inventor: COCINO, Luigi, Amedeo [IT/IT]; Via Puggia, 43, I-16131 Genova (IT).

(74) Agent: ANSELMO GAUTIERO, Maria, Luisa; Studio Rinaldini & Co., Via Dante, 2/33, I-16121 Genova (IT).

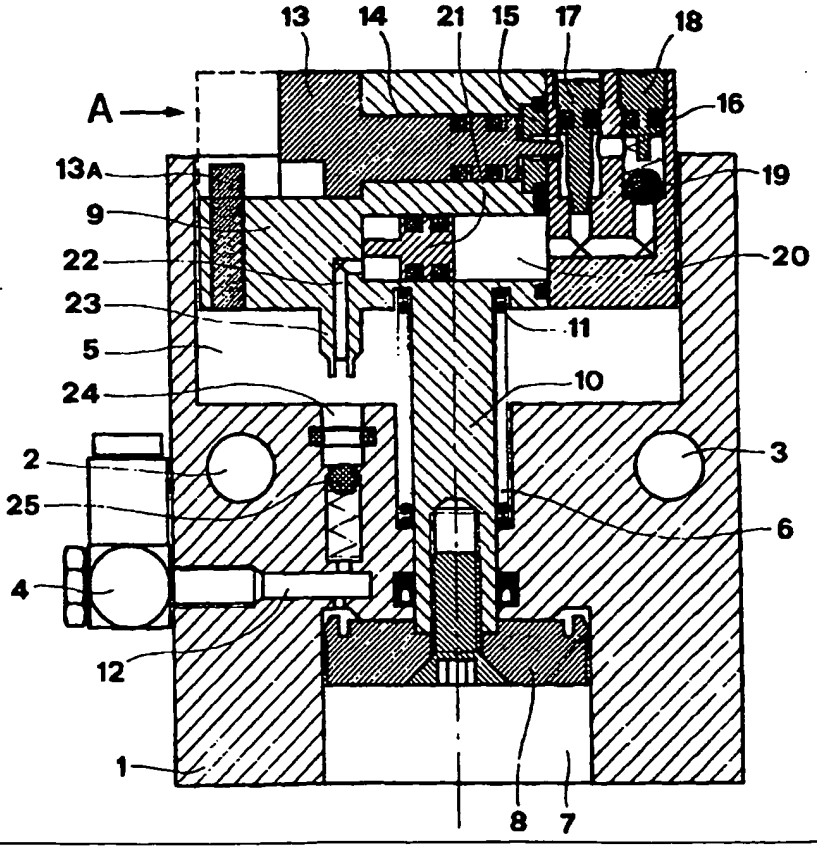
(81) Designated States: DE, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: PNEUMATIC DETENT AND HYDRAULIC DAMPER DEVICE

(57) Abstract

The invention relates to a device for stopping in a dampened manner the platforms on assembly lines as used in the industrial mass-production work, said device - in order to eliminate some disadvantages of the presently-used types operated only pneumatically - has been improved by including in the block-shaped body (1) an interconnected dampening system with hydraulic operation for higher adjustment capability and higher capability of absorbing any operational impact against the movable abutment member (13) together with a softer stopping action, said device being designed to obtain a wider versatility in very different operating fields, and with great attention to its construction to reduce friction and increase operational safety.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgystan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo			SE	Sweden
CH	Switzerland	KR	Republic of Korea	SI	Slovenia
CI	Côte d'Ivoire	KZ	Kazakhstan	SK	Slovakia
CM	Cameroon	LI	Liechtenstein	SN	Senegal
CN	China	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
CZ	Czech Republic	LV	Latvia	TJ	Tajikistan
DE	Germany	MC	Monaco	TT	Trinidad and Tobago
DK	Denmark	MD	Republic of Moldova	UA	Ukraine
ES	Spain	MG	Madagascar	US	United States of America
FI	Finland	ML	Mali	UZ	Uzbekistan
FR	France	MN	Mongolia	VN	Viet Nam
GA	Gabon				

Pneumatic detent and hydraulic damper device.

SPECIFICATION

The present invention relates to a device for stopping the platforms on assembly lines with pneumatic control coupled with an incorporated hydraulic damper or shock-absorber.

In the specific industrial field where use is made of assembly lines carrying a plurality of platforms supporting members to be assembled, it has been remarked that the pneumatically-operated device acting at each operating station for the purpose of timely stopping a platform operates too abruptly, thus causing a displacement of the members resting on the platform, with resulting work troubles. Moreover, excessive wear is often noticed on the parts acting as an abutment, with resultant necessity of replacing said parts, or the like.

As a consequence, assuming obviously as obsolete the early rigid stop devices with a simple pneumatic retraction control, lacking of any dampening effect, and as conventional the more recent devices with control and dampening means of only pneumatic nature, the need has been felt to improve the action, i.e. to achieve a softer action, of the devices used to stop said platforms and to modify their constructional details so as to reduce friction, to increase their shock-absorbing features, and to improve the possibility of adjusting their dampening effect. Data collected during a careful study have enabled various improvements which, by taking advantage of the adjustment possibilities resulting from a hydraulic system coupled with a pneumatic control system, have shown capable of eliminating all the disadvantages heretofore experienced, while ensuring important advantages.

Substantially, said exploitation of hydraulics coupled with a pneumatic control has enabled a very wide range of values in the dampening effect during the stopping action against platforms, and a shock-absorbing capability much higher than normally possible, the inventive system being thoroughly incorporated in a containing block which is entirely similar to the usual containing blocks.

The accompanying drawings show, as a non-limiting example, a preferred

embodiment of the invention. In the drawings:

Fig. 1 is a vertical axial sectional view of a stopping block according to the invention, improved by incorporating therein a hydraulic shock-absorbing or dampening system, wherein the abutment catch is in the retracted position, i.e. subsequent to the stopping action, and the movable assembly carrying said catch and comprising the hydraulic system, in the upper operative position.

Fig. 2 is an enlarged view of a detail of Fig. 1, showing the parts producing the first progressive dampening stage of the stopping stroke of the abutment catch.

Fig. 3 is a view similar to Fig. 1, with said movable assembly in the retracted position, i.e. in the lowered position allowing a platform to travel thereover unhindered, and ready for resetting, i.e. to be moved pneumatically to the protruding upper position for the catching action.

Fig. 4 is a view similar to Fig. 2, but showing the operational stage of Fig. 3.

As shown in the Figures of the drawings, the stop device of the invention comprises a parallelepipedal body 1 with fixing holes 2,3 and a union 4 for connection to a source of compressed air as provided on similar traditional devices. In the device according to the present invention, however, the interior of the body 1 comprises several particular features developped as a result of the study mentioned in the preamble.

Substantially, the block comprises, starting from the top downwards, a recessed rectangular seat 5 with a two-diametre through-hole 6 formed off-center therein and opening at its lower end into the bottom of a cylindrical chamber 7 wherein a disc 8 is slidable axially in piston-like fashion.

A supporting member 9 is slidable axially in the top seat 5 and is provided with an off-center stem 10 designed to be movable in the hole 6. The lower end of said stem is provided with an axial threaded hole for securing the disc/piston 8 thereto, and the stem has threaded thereon a coil spring 11 required to reset the device, as explained below. The slidable member 9, which is forced by its stem 10 to follow the movements

of the disc/piston 8 which is actuated by the pulses of compressed air reaching the chamber 7 via the duct 12 and its branch, houses within suitable recesses a catch or abutment member 13 which is movably mounted in piston-like manner and is provided with annular seals, within a suitable cylindrical seat 14 which is closed at the bottom by an insert or disc 15 in the form of a washer with a central hole to connect the seat 14 to a hydraulic shock-absorbing or dampening system arranged therebehind and housed partly in an inserted smaller block 16 which is provided with suitable communication ducts through which the oil or operative fluid flows in a closed-circuit manner. The travel of the catch 13 outwards is limited by a stop 13A.

At the top, the smaller block 16 comprises an adjustment or choke valve 17 to control the speed of the flow during the first step of the dampening action and a screw 18 to limit the travel of a spring-loaded ball valve 19 which permits a rapid reset flow. At their lower ends, the ducts of the circuit open into the bottom of a cylindrical chamber 20 where is floatingly slidable a small piston 21 which is provided on its back side with a short stem to limit its stroke. At the end opposite to the side provided with the mouth of the ducts of the hydraulic circuit, the chamber 20 is provided with the mouth of a smaller duct 22 which, through a protruding extension 23 (either integral or inserted) can be connected (Fig. 3) to a corresponding duct 24 provided with an annular seal having the function of a sealing abutment seat for an underlying ball valve 25 loaded by a coil spring housed in an underlying chamber communicating through its bottom with a duct 12 for inlet of the control compressed air, thus establishing the pneumatic servo-control connection for the hydraulic system described above. With reference to the last-mentioned system (Figs. 2 and 4), it is to be pointed out that in order to obtain a gradual dual dampening effect, according to the invention, the inner end of the piston-like member 13 is provided with an axial stud-like extension 26 adapted to co-operate with the disc-shaped insert 15 which is arranged and locked between the parts 9 and 16 in a suitable recess provided with a seal. The

insert 15 is provided centrally with a two-diametre through-hole communicating with the adjacent duct of the hydraulic system, said hole being closed in the end positions shown in Figs. 1 and 2. One side of the stud 26, as clearly shown in these Figures, is formed with an oblique longitudinal taper which reduces progressively its sectional area in the direction of its free end. As a result, upon the occurrence of the stopping and dampening stroke, wherein the member 13 moves from the position of Fig. 4 to the position of Fig. 2, an outflow occurs initially through the full section of the related duct, but when approaching the end of said stroke, the stud 26 begins penetrating the hole in the insert 15, i.e. said duct wherethrough oil flows, and gradually chokes it thanks to the progressive tapered cross section of said stud 26, thus obtaining in a simple manner the second effect of gradual dampening, whereas the first effect is obtained thanks to said adjustment and choke screw 17. Of course, the variable cross section of the stud 26 may also be obtained by means of a stepped or conical configuration.

The movable member 9 has a limited vertical operational stroke, and it can assume, as shown in the Figs. 1 and 3 of the drawing, an upper operative stop position and a lower rest position. The latter position is obtained by the compressed air which flows by means of known and suitable systems through the union 4, duct 12 and related branch, into the upper portion of the chamber 7, so that the movable member 9 overcomes the action of the reset coil spring 11 threaded around the stem 10 and is kept in its lower position, i.e. in the fully retracted position. At the same time, the tubular extension 23, integral with the member 9, has penetrated the seat for the ball valve 25 and is connected to the source of compressed air so that the latter enters the chamber 20 and causes the floating piston 21 to move and, thereby, it causes a flow into the hydraulic circuit and through the valve 19 and related duct to displace the member 13 in the cylinder 14 towards the position preparatory to the stoppage action, though in a still lowered position. As soon as, in the chamber 7, the action of the compressed air ceases because it has been interrupted upstream of the union

4, the reset spring pushes upwards the member 9 carrying the catch 13 and the entire hydraulic system. In this position the catch 13 is protruding and is ready to stop an incoming platforms (as indicated by the arrow) which will push it backwards to the position shown in Fig. 1, i.e. the end of the dampened travel. The oil in the hydraulic circuit is caused to flow back into the chamber 20 through the two stages of the gradual dampening action, whereby the interconnecting floating piston 21 is returned to the starting position of Fig. 1. At the same time, as seen in this Figure, the tubular extension 23 is opened to give vent to the compressed air, and the underlying ball valve 25 is closed by its spring and is ready to receive the next pulse of air.

Summarizing, it is useful to point out the two substantial particular features which characterize the device of the invention with respect to the known devices, namely the combined pneumatic/hydraulic operation and the dual choking stage of the outflow of fluid during the dampening step, bearing in mind that, above all, said pneumatic/hydraulic combination enables a wide compliance with the requirements of the assembling operations on platforms even in case of high loads, while the dampening action by means of a co-ordinated hydraulic system enables to comply with the most various requirements of graduality in stopping the platforms.

The device described and shown may undergo changes and improvements within the basic principle of the invention.

CLAIMS

1.- A device for stopping the platforms on assembly lines by a pneumatic control combined with an incorporated hydraulic shock-absorbing or dampening system, comprising a body member in the form of a parallelepipedal block provided with fixing holes and a union for coupling with the source of compressed air pulses, said pulses being admitted into a lower cylinder-and-piston unit to displace, perpendicularly to the direction of movement of the platforms, a member carrying the detent or catch capable of moving with a dampened effect along a gived controlled stopping stroke, said catch being displaced firstly beyond the abutment plane so as to engage an incoming platform and then, at the end of the dampened stopping stroke, below the abutment plane to let the platform pass unhindered, the recovering means being activated during this step, characterized in that the block-shaped body (1) has a recessed rectangular seat (5) with an off-center two-diametre through-hole (6) opening at its lower end into the bottom of a cylindrical chamber (7) wherein a disc (8) is slidable axially in piston-like fashion, said disc being secured to the end of a stem (10) which is movable axially in said hole (6) and carrying at its top end a supporting member (9) which is slidable axially within said recessed rectangular seat (5), said member (9) carrying, inter alia, the movable catch (13) for stopping the platforms.

2.- A device according to claim 1, characterized in that said supporting member (9) which is slidable axially within the recessed seat (5) in the body of said device comprises parallely to the abutment plane a cylinder (14) housing the piston-like stem of a member (13) acting as an abutment or catch member, the rear end of said cylinder being closed by a disc (15) with a central hole to be penetrated, during the dampening step, by a tapered stud (26) provided at the inner end of the piston-like stem of the movable catch (13), thus causing the second stage of the dampening function of an annexed hydraulic system.

3.- A device according to claims 1 and 2, characterized in that matingly secured to the rear side of the disc (15) at the bottom of the

cylinder (14) movably housing the catch member (13) is a smaller block (16) containing the flow ducts of a hydraulic system acted upon by an adjustment and choke screw (17) to form the first dampening stage and by a screw (18) to limit the travel of a small ball-valve (19) enabling a rapid flow, said ducts leading into a cylindrical chamber (20) in the said movable supporting member, a piston-like member (21) being floatingly mounted in said chamber to operate as an interconnecting member between the pneumatic section and the hydraulic section of the device.

4.- A device according to claims 1 to 3, characterized in that the chamber (20) floatingly housing the interconnecting piston (21), on the side opposite to that concerning the hydraulic system, is connected to the source of pneumatic pulses via a duct (22) having a lower mouth in the form of a tubular extension (23) which, when the movable unit is lowered to the retracted position, penetrates the mouth of a duct (24) provided with ball valve (25) and annular seal and coupled with a duct (12) for inlet of compressed air, said valve being temporarily opened by the descent of the movable unit to cause the resetting of the hydraulic system.

5.- A device according to claims 1 to 4, characterized in that it is pre-arranged to pneumatically receive the actuation control, and that the same - by acting on a small floating interconnecting piston (21) - is only used to generate the reset backflow of a hydraulic system adapted to trigger the movable stopping memeber (13).

6.- A device according to claims 1 to 5, characterized in that the hydraulic system comprises two different choking stages having the purpose of ensuring a dual dampening graduality of the stopping stroke of the member constituting the abutment catch (13).

FIG. 1

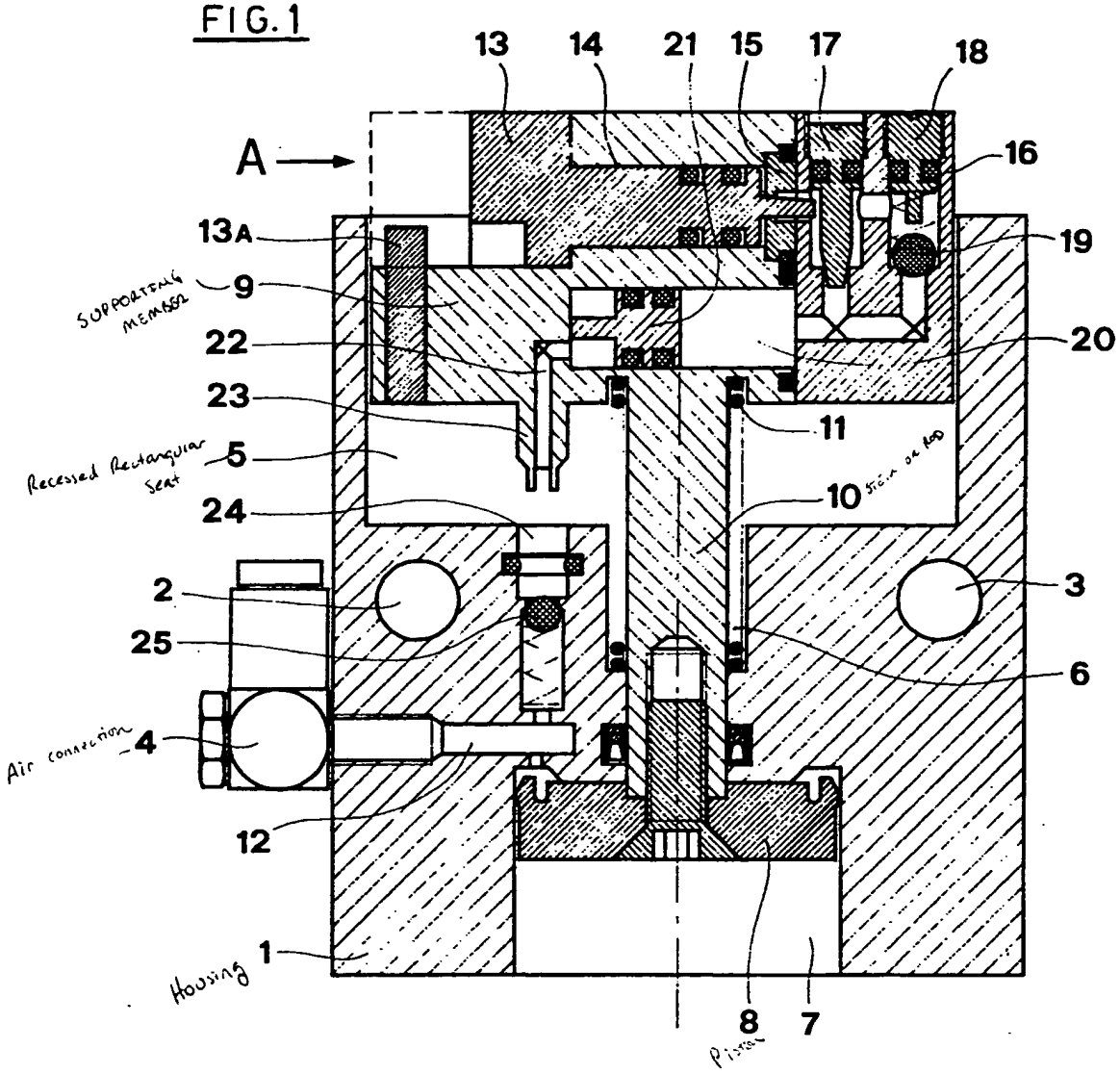

13
14
21
15
17
18
A
16
13A
19
SUPPORTING MEMBER
9
22
20
23
11
Recessed Rectangular Seat
5
10
24
2
3
25
6
Air connection
4
12
Housing
1
8
7
Piston

FIG. 2

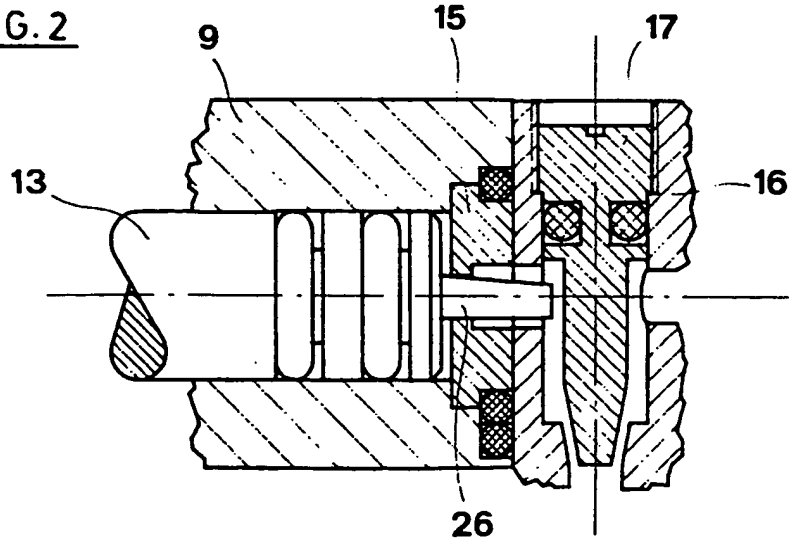

9
15
17
13
16
26

FIG. 3

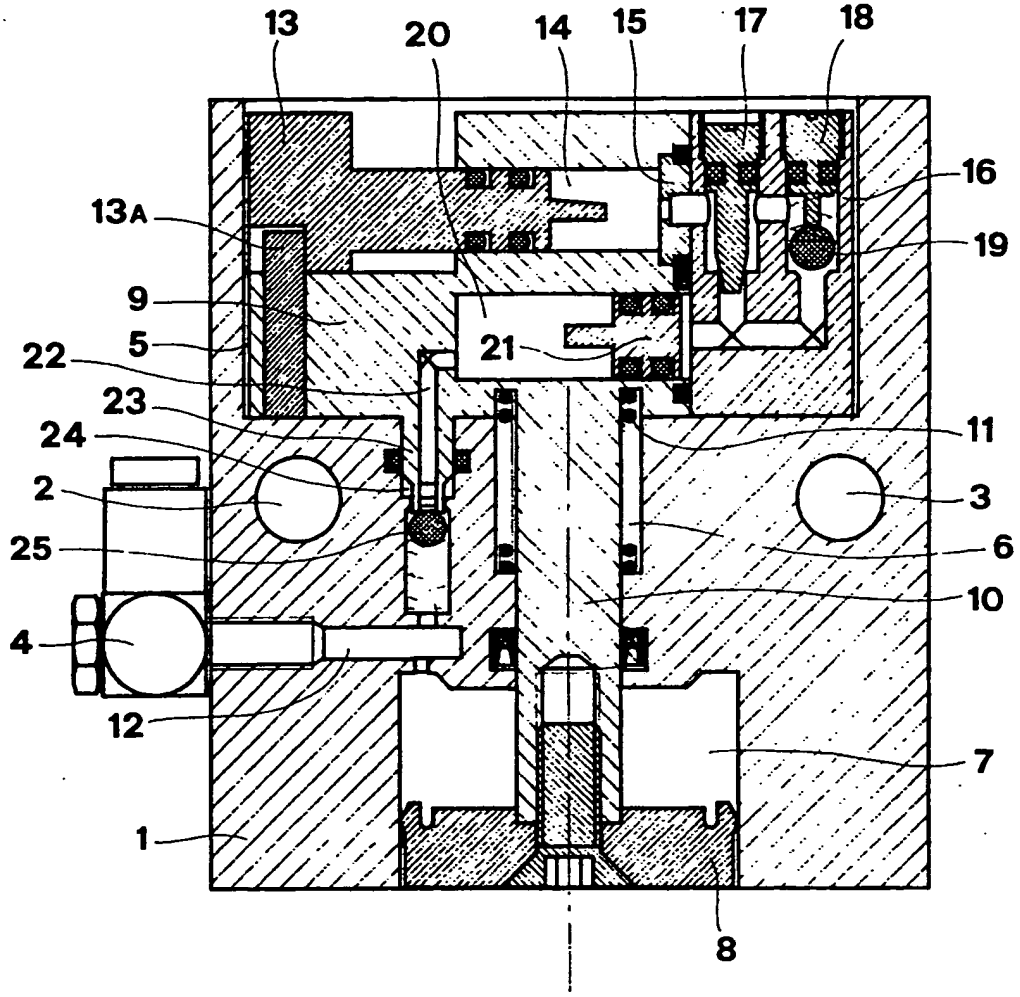
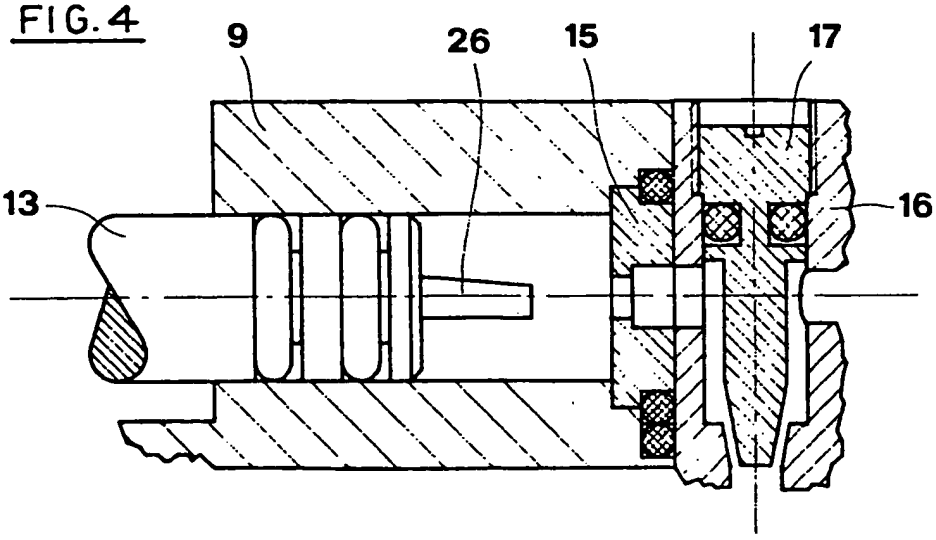

13
20
14
15
17
18
16
13A
19
9
5
21
22
23
11
24
2
3
25
6
10
4
12
7
1
8

FIG. 4


9
26
15
17
13
16

INTERNATIONAL SEARCH REPORT

information on patent family members

International application No.
PCT/IT 93/00119

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0484648	13-05-92	DE-A-	4035286	14-05-92
		DE-U-	9015950	14-02-91
		US-A-	5199537	06-04-93
GB-A-956514		NONE		
DE-A-3806436	07-09-89	DE-C-	3629914	13-08-87
DE-A-4107402	10-09-92	NONE		
DE-B-1214480		NONE		
US-A-3113767		NONE		
DE-C-3832865	06-07-89	NONE		

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IT 93/00119

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B23Q16/00 F16F9/49

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B23Q B21B F16F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	EP,A,0 484 648 (WÖRNER) 13 May 1992 see figures 1,7	1,2 6 3-5
Y	MACHINE DESIGN. vol. 47, no. 22 , 11 September 1975 , CLEVELAND US page 146 'Shock absorbers take the "sudden" out of stops' see right column	6
A	GB,A,956 514 (HAHN) 29 April 1964 see claim 1	1-6
A	DE,A,38 06 436 (WÖRNER) 7 September 1989 see column 3, line 43 - line 53; figure 1	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 March 1994	25.03.94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Carmichael, Guy

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IT 93/00119

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 163 (M-487)(2219) 11 June 1986 & JP,A,61 014 842 (HASHIMOTO FORMING KOGYO K.K.) 23 January 1986 see abstract	1
A	DE,A,41 07 402 (HERMANN HEMSCHEIDT MASCHINENFABRIK GMBH & CO) 10 September 1992 see the whole document	1
A	DE,B,12 14 480 (KEELAVITE HYDRAULICS LIMITED) 14 April 1966 see figure 1	3
A	US,A,3 113 767 (HALBERSTADT) 10 December 1963 see column 2, line 63 - line 68; figure 3	6
A	DE,C,38 32 865 (PROTECH AUTOMATION GMBH) 6 July 1989	

2